



(43) International Publication Date
3 July 2003 (03.07.2003)

PCT

(10) International Publication Number
WO 03/054824 A3

(51) International Patent Classification⁷: G01J 3/453, G01N 21/35

(74) Agent: HONEYWELL INTERNATIONAL INC.; Law Department AB2, P.O. Box 2245, Morristown, NJ 07962 (US).

(21) International Application Number: PCT/US02/30429

(22) International Filing Date:
24 September 2002 (24.09.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/324,397 24 September 2001 (24.09.2001) US

(81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (*regional*): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (*for all designated States except US*): HONEYWELL INTERNATIONAL INC. [US/US]; 101 Columbia Road, P.O. Box 2245, Morristown, NJ 07962 (US).

(71) Applicants and

(72) Inventors: AU, Kwong, W. [US/US]; 4908 West 93rd Street, Bloomington, MN 55437 (US). BUSCH, Darryl, G. [US/US]; 6641 Harlan Drive, Eden Prairie, MN 55346 (US). BEDROS, Saad, J. [US/US]; 378 East Carmel Avenue, West St. Paul, MN 55118 (US). HAMZA, Rida, M. [US/US]; 425 13th Avenue SE, Apartment 1704, Minneapolis, MN 55414 (US). FORDYCE, Jess, E. [US/US]; 16609 Parklane, Minnetonka, MN 55391 (US).

Published:

— with international search report

(88) Date of publication of the international search report:
18 December 2003

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

BEST AVAILABLE COPY

WO 03/054824 A3

(54) Title: SMALL SPECTRAL SIGNAL DETECTION SYSTEM

(57) Abstract: A standoff chemical agent detection system passively detects chemical agents in a scene. Interferograms are generated from received scene spectral information. In one embodiment, the spectral information is apodized, and a chirp Fast Fourier Transform is performed on the interferogram. A calibration curve is applied to correct gain and offset, and a feature vector is generated based on comparison of the normalized spectrum to predetermined chemical shape templates. The feature vector is provided to a classifier to identify the existence and identity of a chemical agent threat. The chemical agent detection system utilizes a lower resolution search mode, and a higher resolution confirmation mode, wherein both modes utilize the same detection algorithms. The neural network is trained using a large database of training data. The network is iteratively trained using partially random subsets of the training data. Problematic data from previous subsets is included in further subsets to improve the training.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01J3/453 G01N21/35

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G01J G01N

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

WPI Data, PAJ, EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 982 486 A (WANG CHUNG-TAO DAVID) 9 November 1999 (1999-11-09) column 1, line 7 - line 11 column 4, line 40 -column 5, line 32 figures 3,5	1,5,9, 11,16, 23-25
A	US 5 241 179 A (CARRIERI ARTHUR H) 31 August 1993 (1993-08-31) column 1, line 15 - line 20 column 2, line 28 -column 3, line 38 figure 1 --- -/-	1,9,16, 24,25

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

A document defining the general state of the art which is not considered to be of particular relevance

E earlier document but published on or after the international filing date

L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

O document referring to an oral disclosure, use, exhibition or other means

P document published prior to the international filing date but later than the priority date claimed

T later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

X document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

Y document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

8 document member of the same patent family

Date of the actual completion of the international search

3 July 2003

Date of mailing of the international search report

10/07/2003

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Krametz, E

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 899 984 A (THOMPSON JAMES ET AL) 4 May 1999 (1999-05-04) column 13, line 37 -column 14, line 37 column 16, line 30 -column 17, line 7 figure 6 ---	1,2,9, 10,16, 17,24-26
A	US 6 266 428 B1 (FLANIGAN DENNIS F) 24 July 2001 (2001-07-24) column 1, line 12 - line 15 column 3, line 12 -column 5, line 15 column 12, line 8 - line 67 figure 20 ---	1,7-9, 13,16, 24,25
A	US 5 631 469 A (CARRIERI ARTHUR H ET AL) 20 May 1997 (1997-05-20) column 1, line 10 - line 14 column 1, line 50 -column 2, line 29 column 3, line 11 - line 32 claim 1 ---	1,2,9, 10,16, 17,24-26
A	US 5 305 076 A (INOUE KAORI ET AL) 19 April 1994 (1994-04-19) column 1, line 9 - line 66 figure 1 -----	1,9,16, 24,25

BEST AVAILABLE COPY

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5982486	A	09-11-1999	NONE	
US 5241179	A	31-08-1993	NONE	
US 5899984	A	04-05-1999	US 5563982 A	08-10-1996
			US 5276772 A	04-01-1994
			US 5613039 A	18-03-1997
			US 5638281 A	10-06-1997
US 6266428	B1	24-07-2001	NONE	
US 5631469	A	20-05-1997	NONE	
US 5305076	A	19-04-1994	JP 3004747 B2	31-01-2000
			JP 4262238 A	17-09-1992
			JP 3004748 B2	31-01-2000
			JP 4262239 A	17-09-1992
			JP 2926278 B2	28-07-1999
			JP 4265840 A	22-09-1992
			JP 2772374 B2	02-07-1998
			JP 4268441 A	24-09-1992
			DE 4203588 A1	20-08-1992

Form PCT/ISA/210 (patent family annex) (July 1992)